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EXAMINER
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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* M. AFFAN ZIDAN, TALAL BONNY,  
and KHALED N. SALAMA

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Appeal 2016-007482<sup>1</sup>  
Application 13/185,849  
Technology Center 1600

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Before DONALD. E. ADAMS, RICHARD M. LEBOVITZ, and MELANIE  
L. McCOLLUM, *Administrative Patent Judges*.

LEBOVITZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal involves claims directed to a computing device comprising a computer application for processing database sequences. The Examiner rejected the claims as patent ineligible subject matter under 35 U.S.C. § 101. We have jurisdiction under 35 U.S.C. § 134. The rejection is reversed.

STATEMENT OF CASE

Appellants appeal from the Examiner's final rejection of claims 13–28. The Examiner withdrew the rejection of the claims as obvious under

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<sup>1</sup> The Appeal Brief (“Appeal Br.”) lists King Abdullah University of Science and Technology as the real-party-in-interest.

pre-AIA 35 U.S.C. § 103(a). Final Rej. 5. The only remaining rejection is under 35 U.S.C. § 101. The Examiner found that independent claims 13 and 21, and dependent claims 14–20 and 22–28 are ineligible for a patent because they are directed to an abstract idea. *Id.* at 2.

Claim 13 is representative and reads as follows:

13. A system, comprising:  
    at least one computing device; and  
    an application executed in the at least one computing device, the application comprising:  
        logic that obtains a plurality of database sequences;  
        logic that orders the plurality of database sequences;  
        logic that determines a splitting ratio associated with the ordered plurality of database sequences, where the splitting ratio separates the ordered plurality of database sequences into a first portion of the ordered plurality of database sequences associated with at least one central processing unit (CPU) and a second portion of the ordered plurality of database sequences associated with a graphical processing unit (GPU), where the length of the database sequences of the first portion of the ordered plurality of database sequences are shorter than the length of the database sequences of the second portion of the ordered plurality of database sequences;  
        logic that assigns the first portion of the ordered plurality of database sequences to the at least one CPU for sequencing by the at least one CPU; and  
        logic that assigns the second portion of database sequences to the GPU for sequencing by the GPU.

Claim 21 is directed to a computer-implemented method comprising the same elements as in claim 13, but recited in the form of steps. Thus, claim 21 stands or falls with claim 13.

## DISCUSSION

### Claims

Claim 13 is directed to a system comprising a computer device and an application executed in the computer device. The application comprises three “logics” which we understand to be each a logic function that comprises computer code (Spec. ¶ 56). The logics perform the following functions:

- 1) obtain a plurality of database sequences;
- 2) order the plurality of database sequences;
- 3) determine a splitting ratio associated with the ordered plurality of database sequences.

The splitting ratio has the following function:

3a) separates a first portion of the database sequences to be assigned to a CPU and separates a second portion of the database sequences to be assigned to a GPU;

3b) where the length of the database sequences of the first portion are shorter than the length of the second portion of database sequences.

The sequences are then assigned to the CPU and GPU for sequencing.

### Rejection

The Examiner found that the claims are directed to an abstract idea because “the method relies on the abstract ideas of comparing information, categorizing, organizing and transmitting information and organizing information through mathematical correlations.” Final Rej. 3. The Examiner found that the claims “do not include additional elements that are sufficient to amount of significantly more than the judicial exception

because it is routine and conventional to perform the acts of using a computing device to order information such as sequence data and using a computer to assign data to various processors.” *Id.* The Examiner found that splitting sequences into a first portion and second portion (3a above) and “assigning short sequences to the CPU and long sequences to the GPU [3b above] is . . . part of the abstract idea.” Ans. 6. The Examiner also found that it was known to process sequence data on a CPU and GPU. *Id.* The Examiner also stated that the claims are directed to an abstract idea because the splitting ratio (3 above) is a mathematical algorithm.

#### Analysis

The determination of patent eligibility under 35 U.S.C. § 101 is a two-step analysis. First, it must be determined whether the claims are directed to an abstract idea or other judicial exception. *DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245, 1255 (2014). Second, the elements of the claims, “both individually and as an ordered combination,” are considered “to determine whether the additional elements transform the nature of the claim into a patent-eligible application of that abstract idea.” *Id.* “This second step is the search for an ‘inventive concept,’ or some element or combination of elements sufficient to ensure that the claim in practice amounts to ‘significantly more’ than a patent on an ineligible concept.” *Id.* (quoting from *Alice Corp. v. CLS Bank Int’l*, 134 S.Ct. 2347, 2355 (2014)).

The Federal Circuit has acknowledged that it is difficult to discern when claims are directed to an abstract idea. *DDR Holdings*, 773 F.3d at 1255. Because of this difficulty, the courts have taken a case-by-case approach:

Instead of a definition, then, the decisional mechanism courts now apply is to examine earlier cases in which a similar or parallel descriptive nature can be seen—what prior cases were about, and which way they were decided.

*Amdocs (Israel) Limited v. Openet Telecom, Inc.*, 841 F.3d 1288, 1294 (2016). In other words, the courts look to the similarities and differences between claims subject to a patent eligibility analysis in earlier decided cases to determine whether the claims at issue constitute subject matter eligible for a patent.

As indicated by the Examiner, the claims in this case involve “comparing information, categorizing, organizing and transmitting information and organizing information” utilizing a mathematical algorithm. Final Rej. 3. We thus turn to the recent cases to determine whether the subject matter is eligible for a patent under § 101.

In *Digitech Image Technologies, LLC v. Electronics for Imaging, Inc.*, 758 F.3d 1344, 1348 (2014), the claims were directed to “a process of taking two data sets and combining them into a single data set, the device profile. The two data sets are generated by taking existing information—*i.e.*, measured chromatic stimuli, spatial stimuli, and device response characteristic functions—and organizing this information into a new form.” The court found that the method claims were drawn to “an abstract idea because it describes a process of organizing information through mathematical correlations and is not tied to a specific structure or machine.” *Id.* at 1350. The claims in this case are distinguishable because they require a CPU and GPU which ties them to a specific structure and machine.

In *In re TLI Commc’ns LLC Patent Litig.*, 823 F.3d 607, 610 (Fed. Cir. 2016), the claims involved a method for recording and administering

digital images having the steps, *inter alia*, of recording images from a telephone unit, storing the images in a digital form, transmitting the digital image data, extracting classification information, and storing the digital information taking into account the classification information. The court found that the claims were directed to an abstract method of classifying and storing digital images in an organized manner, lacking “an inventive solution to any problem presented by combining the two.” *Id.* at 612–613.

Again, we find that the claims in this proceeding are distinguishable because the claimed use of CPU and GPU processing, while not new when each step is considered alone, the combination — particularly of processing short and long sequences differentially on the CPU and GPU was described in the Specification as a solution to a computing problem and was considered inventive by the Examiner as evidenced by the withdrawal of the § 103 rejection (Final Rej. 5). Specifically, the claimed subject matter is described in the Specification as a technique to reduce computer processing time when comparing DNA and protein sequences. Spec. ¶ 15. The Specification teaches:

Increasing interest in studying the structure and the function of DNA, RNA and proteins, and correlating this information with diseases is driving exponential growth in the bioinformatics market. Such information helps researchers to identify drug leads and other therapeutic modalities. However, as the amount of sequence data being examined increases, the computation time of the sequencing applications grows at a staggering rate.

*Id.* at ¶ 2.

The Specification discloses that “[b]y processing the long sequences of the sequence database on the GPU and simultaneously processing the

short sequences on the CPU(s), the speed of the sequence alignment application may be efficiently increased.” *Id.* at ¶ 16.

Thus, in contrast to *TLI*, the rejected claims involve an inventive solution achieved by the combination of CPU and GPU processing upon application of a splitting ratio.

The claims require the use of a mathematical algorithm, a splitting ratio. However, the claims are not simply implementing the algorithm conventionally or abstractly. Rather, the splitting ratio is used to separate the ordered plurality of sequences into first and second portions which are assigned, based on length, to a CPU or GPU for sequence processing. The claims are not directed to the splitting ratio as an abstract idea, but instead are directed to a specific application of it that achieves the purpose of reducing computer processing times when implementing sequence analysis. *See Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1338–39 (2016) (discussion of mathematical algorithms).

The court determined in *BASCOM Glob. Internet Servs., Inc. v. AT&T Mobility LLC*, 827 F.3d 1341, 1349 (Fed. Cir. 2016) that the claims did not “readily lend themselves to a step-one finding that they are directed to a nonabstract idea.” Thus, the court went immediately to the second step of the analysis for eligibility under 35 U.S.C. § 101. The *BASCOM* court found the claims to be patent eligible because the combination of steps in the claims “was not conventional or generic, and the claims did not preempt all ways of filtering content on the Internet—instead, the patent claimed and explained how a particular arrangement of elements was ‘a technical improvement over prior art ways of filtering such content.’” *Amdocs*, 841 F.3d at 1299. As discussed above, the claims in this case also involve a



technical improvement with regards to GPU and CPU processing of sequence data. The claims also do not preempt all ways of performing sequence analysis. See, e.g., Manavski and Valle (“CUDA compatible GPU cards as efficient accelerators for Smith-Waterman sequence alignment,” *BMC Bioinformatics* (Suppl. 2):S10 (pages 1–9), 2008) describing a method of performing Smith-Waterman sequence alignment on GPU cards.

The claims in this case are also similar to those in *Amdocs* where patent eligibility was found. Specifically, *Amdocs* involved claims to a computer program for processing network accounting information comprising a) computer code for receiving a first network accounting record, b) computer code for correlating the record with accounting information from a second source, and b) computer code for using the correlation to enhance the first network accounting record. *Amdocs*, 841 F.3d at 1299. The court found the claims to be patent eligible:

[T]his claim entails an unconventional technological solution (enhancing data in a distributed fashion) to a technological problem (massive record flows which previously required massive databases). The solution requires arguably generic components, including network devices and “gatherers” which “gather” information. However, the claim’s enhancing limitation necessarily requires that these generic components operate in an unconventional manner to achieve an improvement in computer functionality.

*Id.* at 1300–01.

In our opinion, the claims in this case are similar to those in *Amdocs*. Here, computer processing of sequence data is enhanced by generic components that are operated in an unconventional manner by using a splitting ratio to separate sequences into first and second portions based on length and then process them in a CPU or GPU according to length, “where

the length of the database sequences of the first portion of the ordered plurality of database sequences [assigned to a CPU] are shorter than the length of the database sequences of the second portion of the ordered plurality of database sequences [assigned to a GPU].”

For the foregoing reasons, we conclude that claims 13 and 21 are not abstract ideas and are not ineligible for a patent under 35 U.S.C. § 101. The rejection of claims 13 and 21, and dependent claims 14–20 and 22–28, is reversed.

REVERSED